Name _____

NASA/Tropical Rainfall Measuring Mission (TRMM)
Topic #5: Rain
Activity #2: Measuring the Size of "Raindrops"

OBJECTIVE: To measure the size of water drops that represent "rainfall"

BACKGROUND: The Precipitation Radar on TRMM satellite sends a radar pulse into the atmosphere 215 miles below. If the radar pulse strikes participation such as rain or ice, some of the energy is reflected back to the satellite. This reflected energy (called backscatter) signals the presence is used to create images that give information on the intensity and the location of the precipitation in the cloud. To verify (check) the accuracy of the satellite's data, scientists set up investigations using other methods to measure the size and distribution of rain in cloud. Observations from airplanes can be used to check higher altitudes. At the surface researchers can use the sound of rain on the ocean as an indication of drop size. Quite simply, larger drops produce a louder sound than smaller drops as they drop into the water. In this activity you will measure the size of drops based on the size of the impact they produce in a soft powdered surface.

MATERIALS: (per group) cornstarch, sifter or screened tea strainer, metric ruler, eye dropper, small container with water, waxed paper or plastic wrap, calculator, transparency pen, magnifying lens.

PROCEDURE:

1. Lay a piece of waxed paper on a table.
2. Use the pen to mark a 10cm by 10cm square in the center of the waxed paper
3. Sift a smooth, even, thin layer of cornstarch over the 10cm by 10cm area square
4. Use the eyedropper to practice releasing single drops over a non powdered surface of the table. Vary the height from 5cm to 12 cm. Using your practiced method simulate (model) rain by making 19 drops over the powdered surface.
5. Measure the diameter of the drops in millimeters using a ruler and a magnifying lens. Record: #1_____mm, #2_____mm , #3_____mm, #4 _____mm, #5_____mm
   #6_____mm, #7_____mm, #8_____ mm, #9 _____ mm, #10_____mm
6. The "reflective" value of a raindrop is measured by calculating its size to the 6th power.

Examples:
1mm $^{6th\ power}$ = 1x1x1x1x1x1 = 6
2mm $^{6th\ power}$ = 2x2x2x2x2x2 = 64
3mm $^{6th\ power}$ = 3x3x3x3x3x3 = 729
4mm $^{6th\ power}$ = 4x4x4x4x4x4 =_____ Complete the last 3 products.
5mm $^{6th\ power}$ = 5x5x5x5x5x5= _____ Add more calculations for
6mm $^{6th\ power}$ = 6x6x6x6x6x6 = _____ drops larger than 6 mm.

Record the number of drops you have for each size and multiply the reflectivity value in question #5.

Size	Number of drops	X	Reflectivity Value	=	Product
1mm	_____		6		_____
2mm	_____		64		_____
3mm	_____		729		_____
4mm	_____		4069		_____
5mm	_____		____		_____
6mm	_____		____	+	_____

7. Find the sum of the products in Step #6 _____
   This value is similar to the radar reflectivity that real radar measures for a given cloud volume

8. Researchers have developed a series of calculations that help them interpret reflected energy waves from satellites. How would computers make these calculations easier?

_____

9. Scientists test their calculations in laboratories before the satellite is launched. For what reason would they go to select locations in the satellite's path to measure rain?

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